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BIME-026

DIPLOMA VIEP MECHANICAL ENGINEERING (DMEVI)

01100

Term-End Examination

June, 2013

BIME-026: HEAT TRANSFER

Time : 2 hours *Maximum Marks : 70*

*Note : Attempt **any five** questions. Assume suitable missing data if any.*

1. (a) What are the three modes of heat transfer ? Discuss the difference between them. 7

   (b) State and explain Fourier's law of heat conduction. 7

2. (a) Define and explain critical thickness of an insulation. 7

   (b) A composite wall is made up of two slabs with outermost surface temperatures maintained at 1300°C and 115°C. The first slab has a thickness of 500 mm and thermal conductivity of 1.4 W/mK and the thickness and the thermal conductivity of the second slab are 161 mm and 0.35 W/mK respectively. Calculate the conduction heat transfer through this composite wall per square metre and the temperature of the surfaces in contact. 7

3. (a) How does transient heat conduction differ from steady conduction ? 7

(b) A copper slab of surface area 0.25 m^2 and thickness 10 mm has a uniform temperature of 300°C. Its temperature is suddenly lowered by convection in ambient temperature of 40°C with $h = 90\ W/m^2\,°C$. 7

Calculate the time required for the slab to reach the temperature of 110°C. Take $\rho = 9000\ kg/m^3$, $C = 0.38\ kJ/kg°C$ and $K = 370\ W/m°C$.

4. Find the rate of convective heat transfer from a 0.4 m vertical square plate maintained at uniform temperatures 130°C in ambient air at 25°C. 14

Take $v = 20.75 \times 10^{-6}\ m^2/s$, $lr = 0.697$ and $K = 0.03\ W/mK$.

5. Explain the method of classifying regions as laminor, transition and turbulent when forced convection heat transfer takes place over a flat plate. 14

6. (a) Define total emissive power and monochromatic emissive power of a black body. 7

(b) Explain unstable film boiling. Give examples. 7

7. Define the following terms. **3.5x4=14**

(a) Biot Number.

(b) Black body and gray body.

(c) Wien's displacement law.

(d) Stefon - Bottzman Law.